

LISTING OF THE CLAIMS

Claims 1 to 6: (canceled).

7 (new): A rolling method for a flat-rolled metal material, for executing rolling by using rolling equipment comprising a rolling mill and a coiling device for coiling a rolled metal material located at an exit side of said rolling mill;

said rolling mill having an upper roll assembly supporting an upper work roll and a lower roll assembly supporting a lower work roll;

either one, or both, of said upper roll assembly and said lower roll assembly comprising a split entry side backup roll split into at least three segments in an axial direction and a split exit side backup roll split into at least three segments in an axial direction;

said entry side split backup roll and said exit side split backup roll each having a construction supporting both vertical direction load and rolling direction load acting on the work roll supported by said entry side split backup roll and said exit side split backup roll;

each segment of said entry side split backup roll and each segment of said exit side split backup roll independently having a load measuring device;

said method comprising the steps of:

calculating a difference Fr^{df} between rolling direction force Fr^w acting on said work rolls at a right side (operator side) of said work rolls and rolling direction force Fr^D acting on said work rolls at a left side (drive side) of said work rolls based on a measured value of backup roll load measured on each segment of said entry side split backup roll and measured on each segment of said exit side split backup roll by each independent load measuring device;

responsive to said calculated difference Fr^{df} , controlling left-right difference of roll gap between said upper work roll and said lower work roll to result in said calculated difference Fr^{df} approaching zero.

8 (new): A rolling apparatus for a flat-rolled metal material comprising:

a rolling mill having an upper roll assembly supporting an upper work roll and a lower roll assembly supporting a lower work roll;

either one, or both, of said upper roll assembly and said lower roll assembly comprising a split entry side backup roll split into at least three segments in an axial direction and a split exit side backup roll split into at least three segments in an axial direction;

said entry side split backup roll and said exit side split backup roll each having a construction supporting both vertical direction load and rolling direction load acting on the work roll supported by said entry side split backup roll and said exit side split backup roll;

each segment of said entry side split backup roll and each segment of said exit side split backup roll independently having a load measuring device;

a coiling device for coiling rolled metal material arranged at an exit side of said rolling mill;

a calculating device for calculating a difference Fr^{df} between rolling direction force Fr^w acting on said work rolls at right side (operator side) of said work rolls and rolling direction force Fr^D acting on said work rolls at left side (drive side) of said work rolls based on a measured value of backup roll load measured on each segment of said entry side split backup roll and each segment of said exit side split backup roll by each independent load measuring device;

another calculating device for calculating a control quantity based on said calculated difference Fr^{df} for determining left-right difference of roll gap between said upper work roll and said lower work roll to result in said calculated difference Fr^{df} approaching zero;

a control device for controlling said roll gap between said upper work roll and said lower work roll based on said calculated control quantity to set left-right difference in said roll gap between said upper work roll and said lower work roll to result in said calculated difference Fr^{df} approaching zero.